

October 2009

NC7SZU04 TinyLogic[®] UHS Unbuffered Inverter

Features

- Unbuffered for Crystal Oscillator and Analog Applications
- Balanced Output Drive: ±16mA at 4.5V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V V_{CC}
- Low Quiescent Power: I_{CC}<2μA, V_{CC}=5.5V, T_A=25°C
- Ultra-Small MicroPak™ Packages
- Space-Saving SOT23 and SC70 Packages

Description

The NC7SZU04 is a single unbuffered inverter from Fairchild's Ultra-High Speed series of TinyLogic®. The special purpose unbuffered circuit design is primarily intended for crystal oscillator or analog applications. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a broad $V_{\rm CC}$ operating range. The device is specified to operate over the 1.65V to 5.5V $V_{\rm CC}$ range.

Ordering Information

Part Number	Top Mark	© Eco Status	Package	Packing Method
NC7SZU04M5X	7ZU4	RoHS	5-Lead SOT23, JEDEC MO-178 1.6mm	3000 Units on Tape & Reel
NC7SZU04P5X	ZU4	RoHS	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3000 Units on Tape & Reel
NC7SZU04L6X	C5	RoHS	6-Lead MicroPak™, 1.00mm Wide	5000 Units on Tape & Reel
NC7SZU04FHX	C5	Green	6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch	5000 Units on Tape & Reel

For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Connection Diagrams



Figure 1. Logic Symbol

Pin Configurations

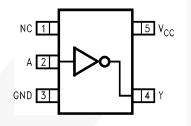


Figure 2. SC70 and SOT23 (Top View)

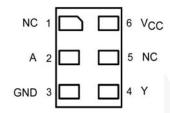


Figure 3. MicroPak (Top Through View)

Pin Definitions

Pin # SC70 / SOT23	Pin # MicroPak	Name	Description
1	1,5	NC	No Connect
2	2	A	Input
3	3	GND	Ground
4	4	Y	Output
5	6	Vcc	Supply Voltage

Function Table

Y = /A

Inputs	Output
Α	Y
L	Н
Н	L

H = HIGH Logic Level

L = LOW Logic Level

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Para	Min.	Max.	Unit	
V _{CC}	Supply Voltage		-0.5	6.0	V
V _{IN}	DC Input Voltage		-0.5	6.0	V
V _{OUT}	DC Output Voltage		-0.5	6.0	V
	DC Input Diada Current	V _{IN} < -0.5V		-50	A
I _{IK}	DC Input Diode Current	$V_{IN} > V_{CC} + 5.0V$		+20	- mA
ı	50 0 × × 51 × 0	V _{OUT} < -0.5V		-50	A
l _{OK}	DC Output Diode Current	$V_{OUT} > 0.5V$, $V_{CC}=GND$		+50	- mA
I _{OUT}	DC Output Current		±50	mA	
I _{CC} or I _{GND}	DC V _{CC} or Ground Current			±100	mA
T _{STG}	Storage Temperature Range		-65	+150	°C
TJ	Junction Temperature Under B	ias		+150	°C
TL	Junction Lead Temperature (So	oldering, 10 Seconds)		+260	°C
		SOT-23		200	
Б	Davier Dissipation at 1959C	SC70-5		150	\^/
P _D	Power Dissipation at +85°C	MicroPak-6	1	130	mW
		MicroPak2-6		120	
ECD.	Human Body Model, JEDEC:JE	SD22-A114		4000	V
ESD	Charge Device Model, JEDEC:	JESD22-C101		2000	

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Conditions	Min.	Max.	Unit
V	Supply Voltage Operating		1.65	5.50	V
V_{CC}	Supply Voltage Data Retention		1.50	5.50	7 V
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage		0	Vcc	V
T _A	Operating Temperature		-40	+85	°C
		SOT-23		300	
0	Thermal Resistance	SC70-5		425	°C/W
$ heta_{\sf JA}$		MicroPak-6		500	- C/VV
		MicroPak2-6		560]

Note:

1. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

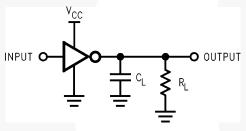
0		.,	Conditions -		$T_A=+25$ °C			T _A =-40 to +85°C		11!.
Symbol	Parameter	V _{CC}			Min.	Тур.	Max.	Min.	Max.	Units
.,	HIGH Level	1.8 to 2.7						0.85V _{CC}		
V_{IH}	Input Voltage	3.0 to 5.5			0.80V _{CC}			0.80V _{CC}		V
.,	LOW Level Input	1.8 to 2.7					0.15V _{CC}		0.15V _{CC}	
V_{IL}	Voltage	3.0 to 5.5	1				0.20V _{CC}		0.20V _{CC}	V
		1.65			1.55	1.65		1.55		
		1.80			1.60	1.80		1.60		
		2.30	V _{IN} =V _{IL,} I _O	_{DH} =-100μA	2.10	2.30		2.10		
		3.00			2.70	3.00		2.70		
	HIGH Level	4.50			4.00	4.40		4.00		.,
V_{OH}	Output Voltage	1.65		I _{OH} =-4mA	1.29	1.52		1.29		V
		2.30		I _{OH} =-4mA	1.90	2.14		1.90		
		3.00	V _{IN} =GND	I _{OH} =-8mA	2.40	2.75		2.40		
		3.00		I _{OH} =-12mA	2.30	2.61		2.30		
		4.50		I _{OH} =-16mA	3.80	4.13		3.80		
	1.65		•		0.00	0.10		0.10		
		1.80				0.00	0.20	\ ₀	0.20	
	7/4	2.30	V _{IN} =V _{IH} , I _{OL} =100µA			0.00	0.20		0.20	
	(A)	3.00				0.00	0.30		0.30	
	LOW Level	4.50				0.00	0.50		0.50	.,
V_{OL}	Output Voltage	1.65		I _{OL} =4mA		0.80	0.24		0.24	V
		2.30		I _{OL} =4mA		0.10	0.30		0.30	
		3.00	V _{IN} =V _{CC}	I _{OL} =8mA		0.17	0.40		0.40	
		3.00		I _{OL} =12mA		0.25	0.55		0.55	
		4.50		I _{OL} =16mA		0.226	0.55		0.55	
I _{IN}	Input Leakage Current	0 to 5.5	V _{IN} =5.5V	GND			±1		±10	μΑ
I _{CC}	Quiescent Supply Current	1.65 to 5.50	V _{IN} =5.5V, GND				2		20	μΑ
\	Peak Supply	1.8				2	1			
loope	Current in	2.5	V _{OUT} =Op	en, st for Peak		4				mA
CCPEAK	Analog	3.3	I _{CC} Curre			10				
Operation	5.0			_	30					

AC Electrical Characteristics

Symbol	Parameter V _{CC}		Conditions	T _A =+25°C		T _A =-40 to +85°C		Units	Figure	
Symbol	Parameter	V _{cc}	Conditions	Min.	Тур.	Max.	Min.	Max.	Ullits	Figure
		1.65		1.0		11.7	1.0	12.1		
		1.80		1.0		8.5	1.0	9.0		1
	2.50 ± 0.20	$C_L=15pF$, $R_I=1M\Omega$,	0.8 6.2 0.8 6.5	6.5						
t _{PLH} ,t _{PHL}	Propagation Delay	3.30 ± 0.30	11(111132,	0.5		4.5	0.5	4.8	ns	Figure 4 Figure 5
		5.00 ± 0.50		0.5		3.9	0.5	4.1		
		3.30 ± 0.30	C _L =50pF,	1.0		6.0	1.0	6.5		
		5.00 ± 0.50	$R_L=500\Omega$,	0.8		5.0	0.8	5.5		
C _{IN}	Input Capacitance	0.00			4.5				pF	
	Power Dissipation	3.30			6.3				pF	Figure 6
C _{PD} Ca	Capacitance ⁽²⁾	5.00			9.5				pΓ	rigule 6

Note:

2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output lading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression: I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}static).



Note:

- 3. C_L includes load and stray capacitance.
- 4. Input PRR=1.0MHz; t_W=500ns

Figure 4. AC Test Circuit

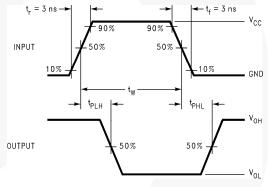
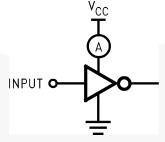


Figure 5. AC Waveforms



Note:

- 5. When operating the NC7SZU04's unbuffered output stage in its linear range, as in oscillator applications, care must be taken to observe maximum power rating for the device and package. The high drive nature of the design of the output stage results in substantial simultaneous conduction currents when the stage is in the linear region. See the I_{CCPEAK} specification in the DC Electrical Characteristics table.
- 6. Input=AC Waveform; t_r=t_f=1.8ns; PRR=variable; Duty Cycle =50%.

Figure 6. Test Circuit

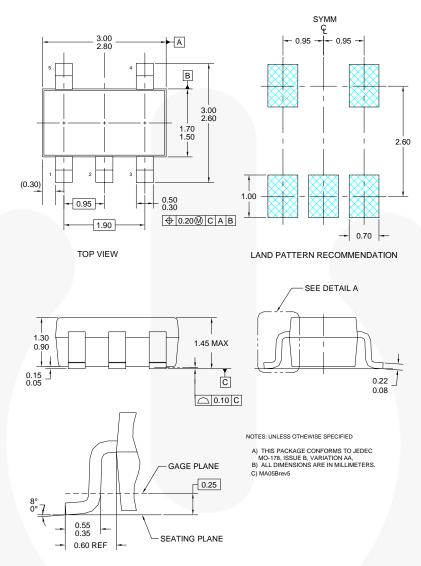


Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6mm

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Tape and Reel Specifications

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: http://www.fairchildsemi.com/packaging/SOT23-5L tr.pdf.

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
M5X	Carrier	3000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	

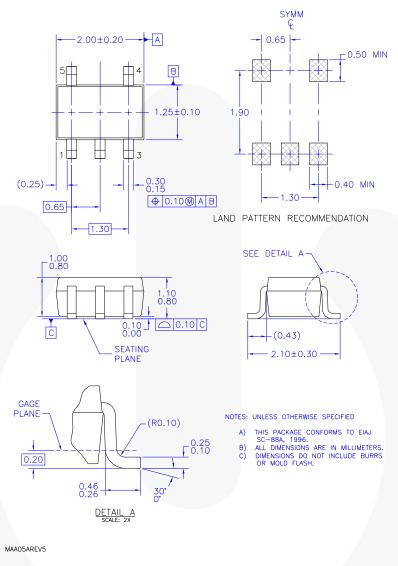


Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25mm Wide

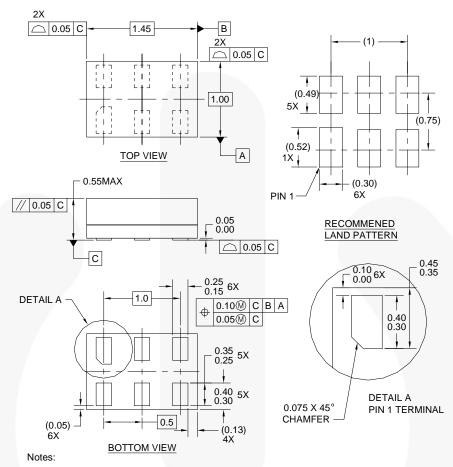
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Tape and Reel Specifications

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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status	
	Leader (Start End)	125 (Typical)	Empty	Sealed	
P5X	Carrier	3000	Filled	Sealed	
	Trailer (Hub End)	75 (Typical)	Empty	Sealed	



- 1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
- 2. DIMENSIONS ARE IN MILLIMETERS
- 3. DRAWING CONFORMS TO ASME Y14.5M-1994

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Figure 9. 6-Lead, MicroPak™, 1.0mm Wide

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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
L6X	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

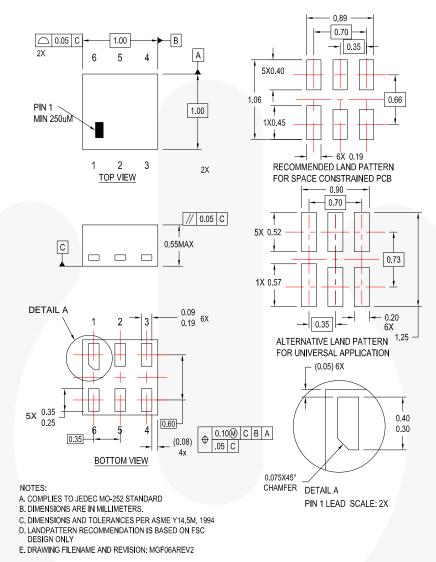


Figure 10.6-Lead, MicroPak2, 1x1mm Body, .35mm Pitch

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Tape and Reel Specifications

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Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
FHX	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed





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